



Image AF 1763

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Masashi UEDA et al.

Group Art Unit: 1763

Application No.: 09/830,879

Examiner: P. Hassanzadeh

Filed: May 2, 2001

Docket No.: 109426

For: INTERNAL ELECTRODE TYPE PLASMA PROCESSING APPARATUS AND
PLASMA PROCESSING METHOD

SUPPLEMENTAL REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In further reply to the April 16, 2003 Final Office Action, and further to the September 16, 2003 Request for Continued Examination with Submission, and further to the October 14, 2003 telephone interview between Applicants' representative and Examiner Hassanzadeh, reconsideration of the rejections is respectfully requested in light of the following remarks.

Claims 1, 4, 5, 7, 19 and 20 are pending. Applicants appreciate the courtesies extended to Applicants' representative by Examiner Hassanzadeh during the October 14, 2003 telephone interview.

The Final Office Action rejects claims 1-3, 5 and 6 under 35 U.S.C. §103(a) over U.S. Patent 5,558,718 to Leung in view of Japanese Patent JP 08-299785A to Nawata *et al.* (Nawata). The Final Office Action further rejects claims 1-7 under 35 U.S.C. §103(a) over U.S. Patent 5,795,492 to Kinoshita *et al.* (Kinoshita) in view of Leung and Nawata. These

rejections are respectfully traversed with respect to claims 1, 4, 5 and 7, and rendered moot with respect to claims 2, 3 and 6.

Applicants assert that Leung teaches that both ends of the antenna-type plasma source are connected to the high frequency power source placed outside the vacuum chamber. The plasma source itself is placed within the vacuum chamber and has a loop shape or spiral shape. The ion-implantation process to the target is performed by the plasma generated by a high frequency wave. Leung teaches that the high frequency wave is supplied in a pulse mode by repeated ON/OFF actions. Also, the frequency of the high frequency wave is “RF” (radio frequency) or “micro frequency”, and therefore the wavelength in Leung differs from Applicants’ claimed features by two or three orders of magnitude. Further, the length of the antenna in Leung is not explicitly specified. Rather, the relationship between the frequency and the antenna is not regarded as important. In fact, the frequency is one of the parameters for greatly controlling the mutual operation as to the electromagnetic wave within the plasma, as described in beginner textbooks on plasma. Thus, Applicants’ claims are patentable over Leung.

Applicants also assert that Nawata teaches an electrode disposed in a vacuum chamber and divided into several parts. Each of the divided electrode parts is provided with a high frequency power supply section. Nawata further provides grounding of each of the divided electrode parts. While the grounding may be similar in structure to Applicants’ disclosure, Nawata teaches that the “length of the wire” required for the grounding is not important. This wire length corresponds to the length from the electrodes to the grounding parts, *e.g.*, the distance to the grounded section of the vacuum chamber. In contrast, the electrode length as distance between the electrode and the grounding section is distinctly claimed in Applicants’ claimed features.

Further, Nawata fails to teach or suggest a size of the electrode and the frequency of the used high frequency wave. Thus, Applicants assert that Nawata does not regard the

relationship between the size (or the length) of the electrode and the frequency to be important. By providing a low frequency and/or small electrode, Nawata teaches away from the importance of the relationship between the size of the electrode and the frequency.

In contrast, Applicants' claimed features provide for an important relationship between the whole length of the electrode and the frequency of the high frequency wave power supplied to the electrode. Thus, Applicants' claims are patentable over Nawata.

Applicants further assert that Kinoshita teaches a parallel plate type electrode structure for high frequency power supplied to one or both of electrodes. Specifically, Kinoshita teaches that the substrates are placed on one or both of the electrodes, and the film is disposed on the substrates by producing the discharge between the electrodes. The discharge is based on the magnetic field generated in the direction parallel to the electrode surface. The discharge uses the mutual action with a magnet placed outside of the vacuum chamber.

The structure of Kinoshita provides for arranging the electrodes in a multi-layer arrangement to increase the number of substrates processed in one disposition process. While such arrangement may have similarities with Applicants' disclosure, Kinoshita teaches the importance of the electrodes being arranged in parallel. The parallel degree for making a pair of parallel plate-type electric electrodes in Kinoshita is naturally a required condition for generating a uniform electric field based on the potential difference produced between the two electrodes. In contrast, Applicants' claimed features are directed to producing an electromagnetic wave. By providing a uniform electric field, rather than an electromagnetic wave, Kinoshita teaches away from Applicants' claims.

Additionally, Applicants' claimed features provide for the electromagnetic field formed in the surroundings of the electrodes by supplying high frequency power to the electrode. Thus, the discharge is maintained by the mutual relationship between the electromagnetic field and the plasma. Further, Applicants' claims include features for the

film being simultaneously deposited onto two substrates by placing the substrates at both sides of the electrode. Therefore, Applicants' claimed features provide for an increase in the number of substrates that can be processed at one time, by making the electrode structure in multi-layer arrangement in order to improve the process capability. While Kinoshita may provide similar arrangement, it is not important within Applicants' claimed features for the electrodes to be mutually parallel. Thus, Applicants' claims are patentable over Kinoshita.

For at least these reasons, Applicants respectfully assert that the claims are now patentable over the applied references and are consequently in condition for allowance. Thus, Applicants respectfully request that the rejections under 35 U.S.C. §103 be withdrawn.

In view of the foregoing remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is requested to contact the Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,



James A. Oliff
Registration No. 27,075

Gerhard W. Thielman
Registration No. 43,186

JAO:GWT/gwt

Date: October 29, 2003

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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